

CLAIMS

1. A coated portion of a vehicle surface comprising:
 - a portion of a surface of a vehicle; and
- 5 a coating film on said portion of the surface of the vehicle, said coating film comprising a plurality of non-photoactive nanoparticles in an amount less than $3 \mu\text{g}/\text{cm}^2$ of the area of said portion of said surface.
- 10 2. The coated portion of a vehicle surface of Claim 1 wherein said coating film has an exposed first surface and a second surface adjacent the portion of the surface to which it is applied, wherein said first surface of said film is hydrophilic.
- 15 3. The coated portion of a vehicle surface of Claim 1 wherein said coating film is less than 300 nanometers thick.
4. The coated portion of a vehicle surface of Claim 1 wherein said coating film is comprised of: said non-photoactive nanoparticles, a wetting agent, and water.
- 15 5. The coated portion of a vehicle surface of Claim 1 wherein at least some of said non-photoactive nanoparticles comprise at least one synthetic mineral.
6. The coated portion of a vehicle surface of Claim 1 wherein at least some of said non-photoactive nanoparticles comprise smectite.
- 20 7. The coated portion of a vehicle surface of Claim 1 wherein at least some of said non-photoactive nanoparticles comprise hectorite.
8. The coated portion of a vehicle surface of Claim 1 wherein at least some of said non-photoactive nanoparticles comprise fluorohectorite.
9. The coated portion of a vehicle surface of Claim 4 wherein said coating film comprises a non-functional level of binder material.
- 25 10. The coated portion of a vehicle surface of Claim 4 wherein said coating film comprises less than 3% peptizer.

11. A method of forming a surface coating film for at least partially covering a surface of a vehicle, said method comprising:
- (a) locating a vehicle with at least one surface;
- (b) depositing an aqueous composition comprising a plurality of non-photoactive nanoparticles and a wetting agent on at least a portion of the surface of said substrate, said non-photoactive nanoparticles being deposited in an amount less than $3 \mu\text{g}/\text{cm}^2$ of the area of the surface; and
- (c) allowing said composition to dry without rinsing or agitating the same so that a substantially clear, hydrophilic coating is formed on said at least a portion of said surface.
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12. The method of Claim 11 wherein said at least some of said nanoparticles are disc-shaped or platelet-shaped, and said disc-shaped or platelet-shaped nanoparticles have at least one dimension that is greater than or equal to about 0.5 nanometers, and an aspect ratio is greater than or equal to about 15.
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13. The method of Claim 11 wherein said at least some of said nanoparticles are rod-shaped, and said rod-shaped nanoparticles have at least one dimension that is greater than or equal to about 0.5 nanometers, and an aspect ratio is greater than or equal to about 3.
14. The method of Claim 11 wherein said coating is less than 300 nanometers thick.
15. The method of Claim 11 wherein when said coating at least partially covers a surface that has an initial specular gloss reading before said composition is applied of greater than or equal to 10 at 60° geometry, said surface with said coating thereon has less than or equal to a 10% reduction in specular gloss value when measured at the geometry specified in the Specular Gloss test.
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16. The method of Claim 11 wherein when said coating at least partially covers a surface that has an initial specular gloss reading before said composition is applied of less than 10 at 60° geometry, said surface with said coating thereon has an increase of greater than or equal to a 10% in specular gloss value when measured at the geometry specified in the Specular Gloss test.
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17. The method of Claim 11 wherein said composition is deposited by spraying the composition onto the surface.

18. The method of Claim 17 wherein said composition is sprayed onto the surface by an electrostatic sprayer.

5 19. The method of Claim 11 wherein the step (b) of depositing said composition on the surface forms a wet film on at least a portion of said surface.

20. The method of Claim 11 wherein the step (b) of depositing an aqueous composition on at least a portion of the surface of said substrate forms a wet film on said portion of the surface of said substrate, and said wet film has less than 61 defects of a size greater than or equal to 1.75 mm per 100 cm² of the surface as measured at any time more than 30 seconds after the wet film is formed on said surface.

10 21. The method of Claim 11 wherein the visual score of the coating formed in step (c) is greater than or equal to (-2).

15 22. A method for cleaning and treating a surface of a vehicle, said method comprising the steps of:

(a) applying a cleaning solution to the surface of a vehicle;

(b) optionally contacting the surface of the vehicle with the cleaning solution thereon and agitating the cleaning solution to loosen dirt on the surface of the vehicle;

(c) rinsing the surface of the vehicle with water to remove at least some of the cleaning solution;

(d) at least partially removing any residue-forming substances remaining on the surface of the vehicle, if any residue-forming substances remain on the surface of the vehicle;

(e) applying a treating composition to the surface of the vehicle, said treating composition optionally comprising an effective amount of non-photoactive nanoparticles;

- (f) allowing the treating composition to dry on the surface of the vehicle before the surface of the vehicle is contacted by water.
23. The method of Claim 22 wherein said cleaning solution comprises at least one water-soluble or water dispersible copolymer comprising, in the form of polymerized units
- 5 (1) at least one monomer compound of general formula I:
- $$\begin{array}{c}
 \text{R}_1 \\
 | \\
 \text{H}_2\text{C}=\text{C}-\text{Z}-[\text{CH}_2]_n-\overset{\text{X}}{\underset{\text{R}_2}{\underset{|}{\text{N}}^+}}-\overset{\text{X}}{\underset{\text{R}_2}{\underset{|}{\text{N}}^+}}-\overset{\text{X}}{\underset{\text{R}_4}{\underset{|}{\text{B}}}}-\overset{\text{X}}{\underset{\text{R}_5}{\underset{|}{\text{N}}^+}}-\text{R}_6 \\
 | \\
 \text{R}_3 \qquad \qquad \qquad \text{R}_3 \qquad \qquad \qquad \text{R}_6
 \end{array}$$
- in which:
- R₁ is a hydrogen atom or a methyl or ethyl group;
 - R₂, R₃, R₄, R₅ and R₆, which are identical or different, are linear or branched C₁-C₆, preferably C₁-C₄, alkyl, hydroxyalkyl or aminoalkyl groups;
 - m is an integer from 0 to 10, preferably from 0 to 2;
 - n is an integer from 1 to 6, preferably from 2 to 4;
 - Z represents a -C(O)O- or -C(O)NH- group or an oxygen atom;
 - A represents a (CH₂)_p group, p being an integer from 1 to 6, preferably from 2 to 4;
 - B represents a linear or branched C₂-C₁₂, advantageously C₃-C₆, polymethylene chain optionally interrupted by one or more heteroatoms or heterogroups, in particular O or NH, and optionally substituted by one or more hydroxyl or amino groups, preferably hydroxyl groups;
 - X, which are identical or different, represent counterions;

- (2) at least one hydrophilic monomer carrying a functional group with an acidic nature which is copolymerizable with (1) and which is capable of being ionized in the application medium;
- (3) optionally at least one monomer compound with ethylenic unsaturation with a neutral charge which is copolymerizable with (1) and (2), preferably a hydrophilic monomer compound with ethylenic unsaturation with a neutral charge, carrying one or more hydrophilic groups, which is copolymerizable with (1) and (2).
- 5 24. The method of Claim 23 wherein the step (d) comprises rinsing the surface of the vehicle with purified rinse water.
- 10 25. The method of Claim 24 wherein a polymer is added to the rinse water used in step (c), to said purified rinse water used in step (d), or to both.
- 15 26. The method of Claim 22 wherein at least one of said cleaning composition and treating composition comprises a silicone superwetting agent.